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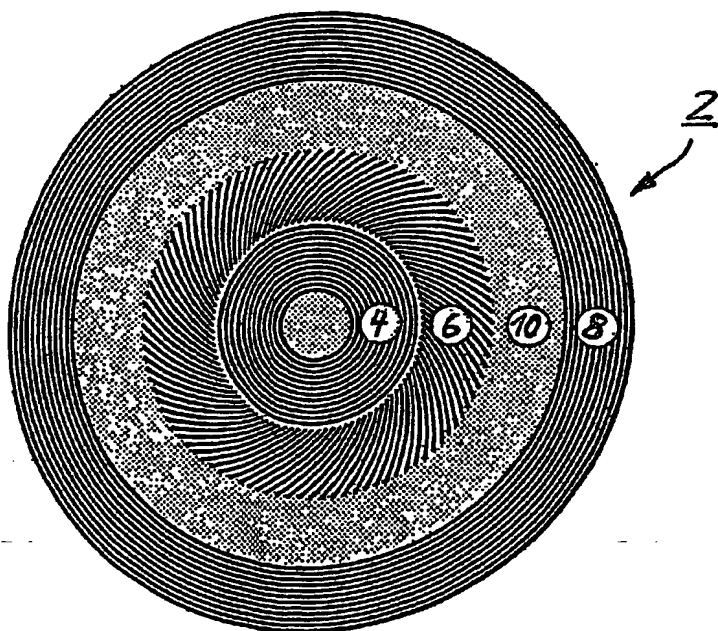
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[Continued on next page]

(54) Title: METHOD FOR GENERATING A CIRCULAR PERIODIC STRUCTURE ON A BASIC SUPPORT MATERIAL



(57) Abstract: The aim of the invention is to provide a method allowing generation of periodic curved structures in a basic support material such as the basic layer for the magnetic bit cells of a magnetic storage device. This aim is achieved according to the invention by a method for generating a periodic circular structure for a support (12) for a magnetic storage device, comprising: a) generating a number of masks with each mask having at least one transmission diffraction gratings (4, 6, 8, 20 to 34, 38, 42, 46)) each having a different periodic concentric circular and/or spiral-like periodic pattern and/or a periodic radial spoke pattern; b) positioning of one or more of said diffraction masks (4, 6, 8, 20 to 34, 38, 42, 46) simultaneously or successively in a certain distance of a basic support material (12) to be patterned; c) applying light beams through each of the diffraction masks (4, 6, 8, 20 to 34, 38, 42, 46) for exposing the basic support material to said light beam; d) interfering the different light beams diffracted by the

gratings on each mask in order to generate coincident light intensity pattern on the surface of the basic support material (12); and e) optionally repeating the exposure procedure a number of times with different masks to obtain a desired pattern of a periodic circular structure with possible partitioning in the circumferential direction.

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ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, COMPENDEX, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 360 586 A (SMITH HENRY I ET AL) 23 November 1982 (1982-11-23) column 1, line 20 - line 21 column 2, line 67 - column 3, line 16 column 5, line 50 - line 56 abstract; claim 7; figure 2	1,4-6
X	WO 98/12603 A (HERZIG HANS PETER ; BLATTNER PETER (CH); VOELKEL REINHARD (CH); HUGLE) 26 March 1998 (1998-03-26) page 1, line 18 - page 2, line 19 page 3, line 8 - page 4, line 30 figures 2-5	1,4-6
X	EP 0 352 975 A (AMERICAN TELEPHONE & TELEGRAPH) 31 January 1990 (1990-01-31) page 4, line 7 - line 36 figures 1,2	1,4-6
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 415 835 A (BRUECK STEVEN R J ET AL) 16 May 1995 (1995-05-16) abstract; figures column 4, line 20 - line 30</p>	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 4360586	A	23-11-1982	DE	3069266 D1	31-10-1984
			EP	0020132 A2	10-12-1980
			CA	1153227 A1	06-09-1983
			JP	56026438 A	14-03-1981
WO 9812603	A	26-03-1998	WO	9812603 A1	26-03-1998
EP 0352975	A	31-01-1990	US	4947413 A	07-08-1990
			CA	1321496 C	24-08-1993
			EP	0352975 A2	31-01-1990
			JP	3027516 A	05-02-1991
			KR	9107220 B1	20-09-1991
US 5415835	A	16-05-1995	US	RE35930 E	20-10-1998